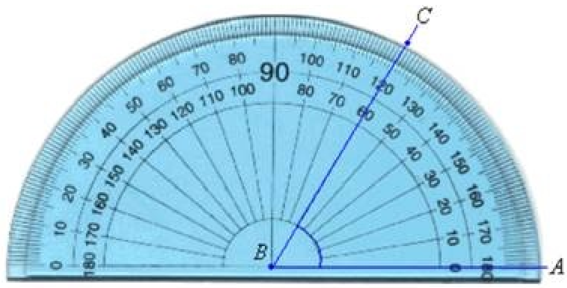
Chapter : 14. MEASUREMENT OF ANGLES

Exercise : 14

Question: 1 A

Using a protracto

Solution:



• Draw a straight line AB.

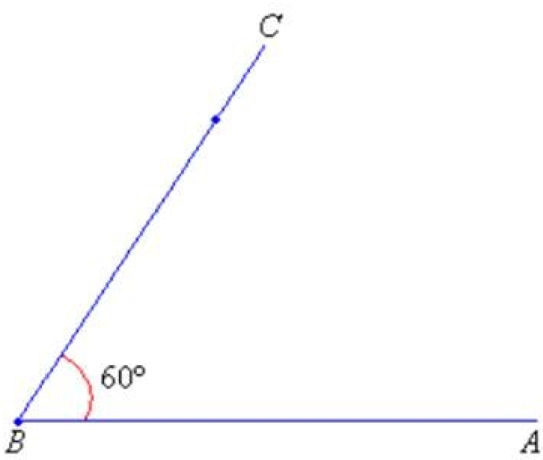
• Place a dot at B. This dot represents the vertex of the angle.

• Place the centre of the protractor at B and the baseline of the protractor along the arm BA.

• Find 60° on the scale and mark a small dot at the edge of the protractor.

• Join the vertex B to the small dot with a ruler to form the second arm, BC, of the angle.

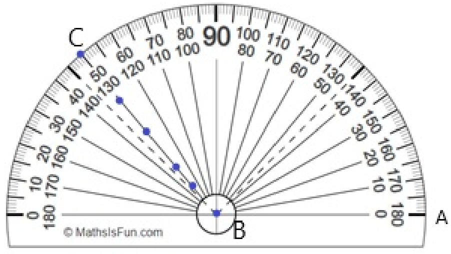
• Mark the angle with a small arc as shown below.



Question: 1 B

Using a protracto

Solution:



• Draw a straight line AB.

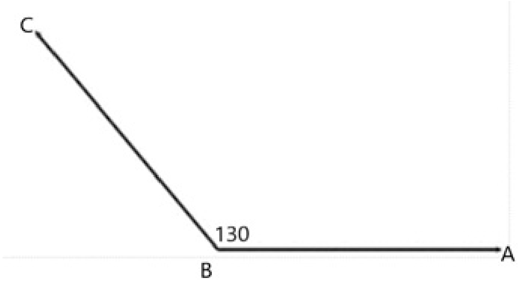
• Place a dot at B. This dot represents the vertex of the angle.

• Place the centre of the protractor at B and the baseline of the protractor along the arm BA.

• Find 130° on the scale and mark a small dot at the edge of the protractor.

• Join the vertex B to the small dot with a ruler to form the second arm, BC, of the angle.

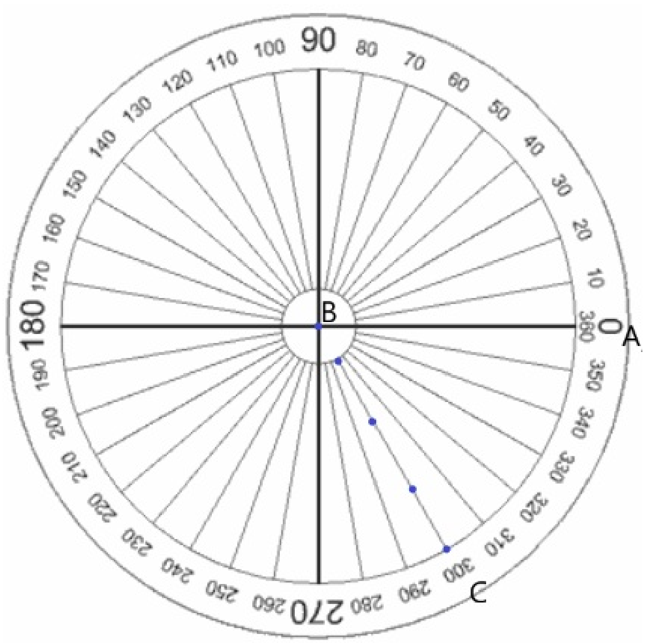
• Mark the angle with a small arc as shown below.



Question: 1 C

Using a protracto

Solution:



• Draw a straight line AB.

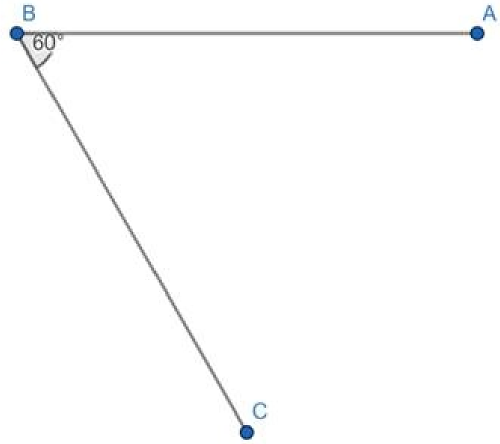
• Place a dot at B. This dot represents the vertex of the angle.

• Place the centre of the protractor at B and the baseline of the protractor along the arm BA.

• Find 300° on the scale and mark a small dot at the edge of the protractor.

• Join the vertex B to the small dot with a ruler to form the second arm, BC, of the angle.

• Mark the angle with a small arc as shown below.



Question: 1 D

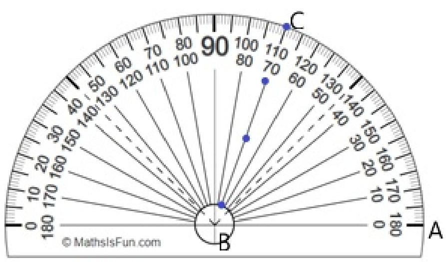
Using a protracto

Solution:

The given angle is greater than 360°

Adding or subtracting 360° from a particular angle does’nt changes its position.

Therefore, Angle can also be written at as = 430° – 360° = 70°



• Draw a straight line AB.

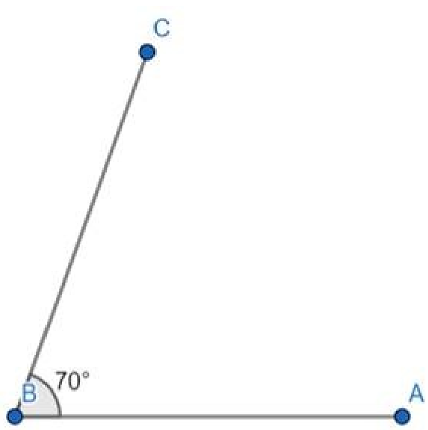
• Place a dot at B. This dot represents the vertex of the angle.

• Place the centre of the protractor at B and the baseline of the protractor along the arm BA.

• Find 70° on the scale and mark a small dot at the edge of the protractor.

• Join the vertex B to the small dot with a ruler to form the second arm, BC, of the angle.

• Mark the angle with a small arc as shown below.



Question: 1 E

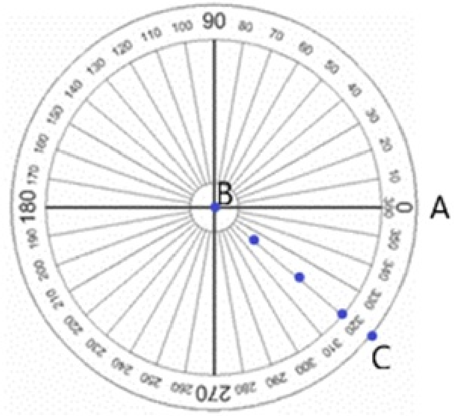
Using a protracto

Solution:

The given angle is negative

Adding or subtracting 360° from a particular angle does’nt changes its position.

Therefore, Angle can also be written as=-40° + 360° = 320°



• Draw a straight line AB.

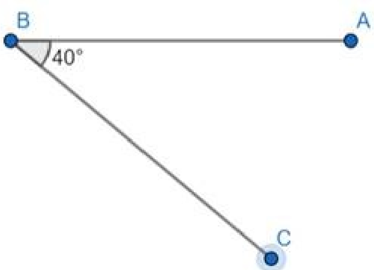
• Place a dot at B. This dot represents the vertex of the angle.

• Place the centre of the protractor at B and the baseline of the protractor along the arm BA.

• Find 320° on the scale and mark a small dot at the edge of the protractor.

• Join the vertex B to the small dot with a ruler to form the second arm, BC, of the angle.

• Mark the angle with a small arc as shown below.

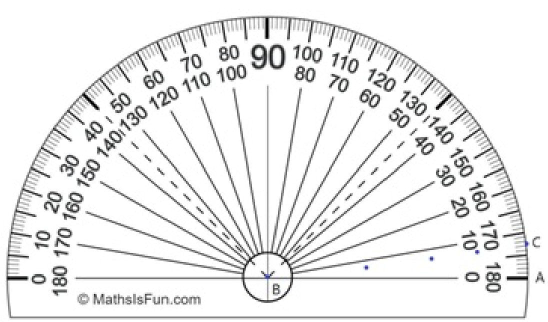


Question: 1 F

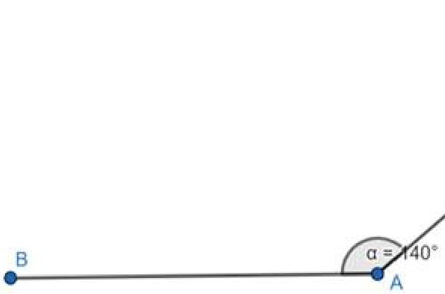
Using a protracto

Solution:

Given angle can be completely written in degree as = -220°



-220° = 360° - 220° = 140°



Question: 1 G

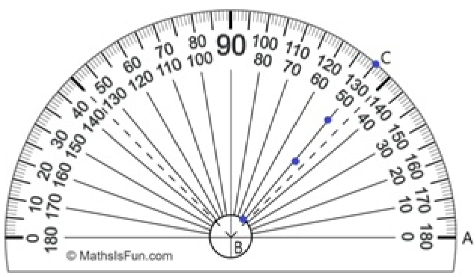
Using a protracto

Solution:

The given angle is negative

Adding or subtracting 360° from a particular angle does’nt changes its position.

Therefore, Angle can also be written as=-310° + 360° = 50°



• Draw a straight line AB.

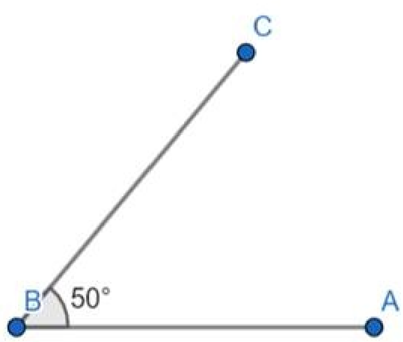
• Place a dot at B. This dot represents the vertex of the angle.

• Place the centre of the protractor at B and the baseline of the protractor along the arm BA.

• Find 50° on the scale and mark a small dot at the edge of the protractor.

• Join the vertex B to the small dot with a ruler to form the second arm, BC, of the angle.

• Mark the angle with a small arc as shown below.



Question: 1 H

Using a protracto

Solution:

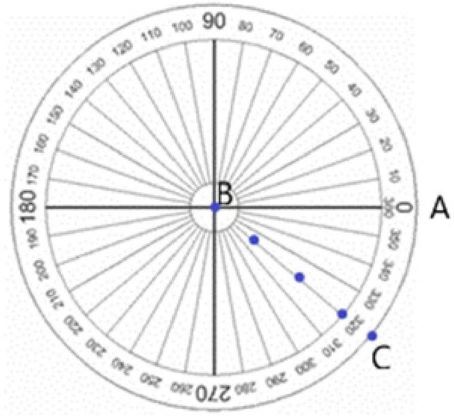
The given angle is negative

Adding or subtracting 360° from a particular angle does’nt changes its position.

Therefore, Angle can also be written as=-400° + 360° = -40°

The angle is still negative, so we will further add 360° to it.

Therefore, Angle can also be written as=-40° + 360°=320°



• Draw a straight line AB.

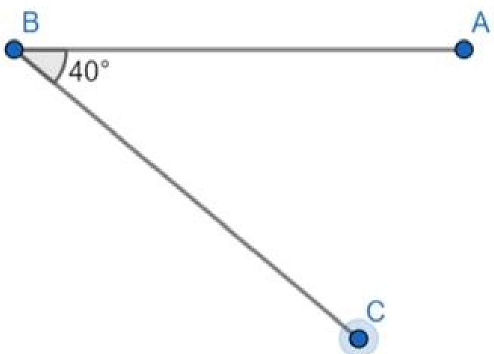
• Place a dot at B. This dot represents the vertex of the angle.

• Place the centre of the protractor at B and the baseline of the protractor along the arm BA.

• Find 320° on the scale and mark a small dot at the edge of the protractor.

• Join the vertex B to the small dot with a ruler to form the second arm, BC, of the angle.

• Mark the angle with a small arc as shown below.



Question: 1

Express each of t

Solution:

Formula : Angle in radians = Angle in degrees $\times \frac{\pi}{180}$

Therefore, Angle in radians =. $36 \times \frac{\pi}{180} = \frac{\pi}{5}$

Question: 2 A

Express each of t

Solution:

Formula : Angle in radians = Angle in degrees $\times \frac{\pi}{180}$

Therefore, Angle in radians = $120 \times \frac{\pi}{180} = \frac{2\pi}{3}$

Question: 2 C

Express each of t

Solution:

Formula : Angle in radians = Angle in degrees $\times \frac{\pi}{180}$

Therefore, Angle in radians $= 225 \times \frac{\pi}{180} = \frac{5\pi}{4}$

Question: 2 D

Express each of t

Solution:

Formula : Angle in radians $=$ Angle in degrees $\times \frac{\pi}{180}$

Therefore, Angle in radians $= 330 \times \frac{\pi}{180} = \frac{11\pi}{6}$

Question: 2 E

Express each of t

Solution:

Formula : Angle in radians $=$ Angle in degrees $\times \frac{\pi}{180}$

Therefore, Angle in radians $= 400 \times \frac{\pi}{180} = \frac{20\pi}{9}$

Question: 2 F

Express each of t

Solution:

Formula : Angle in radians $=$ Angle in degrees $\times \frac{\pi}{180}$

The angle in radians $= \frac{\text{angle in minutes}}{60}$

Therefore, the total angle $= 7 + \frac{30}{60} = 7.5$

Therefore, Angle in radians $= 7.5 \times \frac{\pi}{180} = \frac{\pi}{24}$

Question: 2 G

Express each of t

Solution:

Formula : Angle in radians $=$ Angle in degrees $\times \frac{\pi}{180}$

Therefore, Angle in radians $= -270 \times \frac{\pi}{180} = -\frac{3\pi}{2}$

Question: 2 H

Express each of t

Solution:

Formula : Angle in radians $=$ Angle in degrees $\times \frac{\pi}{180}$

The angle in radians $= \frac{\text{angle in minutes}}{60}$

Therefore, the total angle $= -\left(22 + \frac{30}{60}\right) = -22.5$

Therefore, Angle in radians $= -22.5 \times \frac{\pi}{180} = -\frac{\pi}{8}$

Question: 3

(i) Formula : Angle in degrees $=$ Angle in radians $\times \frac{180}{\pi}$

Therefore, Angle in degrees $= \frac{5\pi}{12} \times \frac{180}{\pi} = 75°$

(ii) Formula : Angle in degrees = $\text{Angle in radians} \times \frac{180}{\pi}$

Therefore, Angle in degrees = $-\frac{18\pi}{5} \times \frac{180}{\pi} = -648°$

(iii) Formula : Angle in degrees = $\text{Angle in radians} \times \frac{180}{\pi}$

The angle in minutes = Decimal of angle in radian x 60.’

The angle in seconds = Decimal of angle in minutes x 60.’’

Therefore, Angle in degrees = $\frac{5}{6} \times \frac{180}{\pi} = \frac{150}{22/7} = 47.7272°$

Angle in minutes = $0.7272 \times 60' = 43.632'$

Angle in seconds = $0.632 \times 60'' = 37.92''$

Final angle = $47°\ 43'\ 38''$

(iv) Formula : Angle in degrees = $\text{Angle in radians} \times \frac{180}{\pi}$

The angle in minutes = Decimal of angle in radian x 60.’

The angle in seconds = Decimal of angle in minutes x 60.’’

Therefore, Angle in degrees = $-4 \times \frac{180}{\pi} = -\frac{720}{22/7} = -229.0909°$

Angle in minutes = $0.0909 \times 60' = 5.4545'$

Angle in seconds = $0.4545 \times 60'' = 27.27''$

Final angle = $-229°\ 5'\ 27''$

Question: 4

The angles of a t

Solution:

Let a - d, a, a + d be the three angles of the triangle that form AP.Given that the greatest angle is double the least.Now, a + d = 2(a - d)2a - 2d = a + da = 3d ......(1)Now by angle sum property,(a - d) + a + (a + d) = 180°3a = 180°a = 60° ...... (2)from (1) and (2),3d = 60°d = 20°Now, the angles are,a - d = 60°- 20° = 40°a = 60°a + d = 60° + 20° = 80°.

Therefore the required angles are 40° 60° 80°

Question: 5

The difference be

Solution:

The angle in degree = $\frac{\pi}{5} \times \frac{180}{\pi} = 36°$

= 36°

Let, two acute angles are x and y

so,

ATQ, x - y= 36°......(1)

x+ y= 90°......(2)

solving 1 & 2, we get;

⇒ 2x= 126°

⇒ x= 63°

putting the value of x in 2, we get;

$\Rightarrow 63° + y = 90°$

$\Rightarrow y = 27°$

so, Two acute angles are 63° & 27°

Question: 6

Find the radius o

Solution:

Angle in radians = Angle in degrees $\times \frac{\pi}{180}$

$\theta = \frac{l}{r}$ where θ is central angle, l=length of arc, r=radius

Therefore angle $= 45 \times \frac{\pi}{180} = \frac{\pi}{4}$

Now,

$r = \frac{l}{\theta}$

$= \frac{33}{\pi/4} = \frac{132}{22/7} = \frac{924}{22} = 42$

Therefore radius is 42 cm

Question: 7

Find the length o

Solution:

Angle in radians = Angle in degrees $\times \frac{\pi}{180}$

$\theta = \frac{l}{r}$ where θ is central angle, l=length of arc, r=radius

Therefore angle $= 36 \times \frac{\pi}{180} = \frac{\pi}{5}$

Now,

$l = r \times \theta$

$= 14 \times \frac{\pi}{5} = 14 \times \frac{22}{35} = \frac{44}{5} = 8.8$

Therefore the length of the arc is 8.8 cm

Question: 8

If the arcs of th

Solution:

Angle in radians = Angle in degrees $\times \frac{\pi}{180}$

$\theta = \frac{l}{r}$ where θ is central angle, l=length of arc, r=radius

Therefore $\theta_1 = 75 \times \frac{\pi}{180} = \frac{5\pi}{12}$

$\theta_2 = 120 \times \frac{\pi}{180} = \frac{2\pi}{3}$

$l = r \times \theta$

Now, as the length is the same

Therefore, $r_1 \times \theta_1 = r_2 \times \theta_2$

$r_1 \times \frac{5\pi}{12} = r_2 \times \frac{2\pi}{3}$

$\frac{r_1}{r_2} = \frac{12}{5\pi} \times \frac{2\pi}{3} = \frac{24}{15} = \frac{8}{5}$

Therefore the ratio of their radii is 8 : 5

Question: 9

Find the degree m

Solution:

Angle in radians = Angle in degrees $\times \frac{\pi}{180}$

$\theta = \frac{l}{r}$ where θ is central angle, l=length of arc, r=radius

Now,

$\theta = \frac{l}{r}$ and r = 0.5 x diameter

$= \frac{16.5}{30}$ radians

θ in degrees $= \frac{16.5}{30} \times \frac{180}{\pi} = \frac{16.5}{30} \times \frac{180}{22/7} = \frac{16.5}{30} \times \frac{180\times 7}{22} = \frac{20790}{660} = 31.5°$

θ in minutes = 0.5 x 60 = 30’

Therefore angle subtended at the center is 31° 30’

Question: 10

In a circle of di

Solution:

Diameter = 30 cm

Length of chord = 15 cm

Radius = 15 cm [r = 0.5 x diameter]

Since the radius is equal to the length of the chord

Hence the formed triangle in the circle is an equilateral triangle.

θ = 60°

We know that l = r × θ

$l = 15 \times 60 \times \frac{\pi}{180} = 5 \times \pi = 5 \text{ x } 3.14 = 15.7$

Therefore, the length of the minor arc is 15.7 cm

Question: 11

Find the angle in

Solution:

We know that l = r × θ

Here l = length of arc = 11 cm

R = radius = length of pendulum = 45 cm

We need to find θ

11 = 45 x θ

$\theta = \frac{11}{45}$ radian

θ in degree = $\frac{11}{45} \times \frac{180}{\pi} = \frac{44}{22/7} = 14°$

Question: 12

The large hand of

Solution:

For 20 minutes = θ = 4 x 30° = 120°

We know that $l = r \times \theta$

$l = 42 \times 120 \times \frac{\pi}{180} = 28 \times \frac{22}{7} = 88$

Therefore, the length is equal to 88 cm.

Question: 13

A wheel makes 180

Solution:

Given that Number of revolutions per minute = 180

Then per second, it will be = 180/60 =3

We know that In one complete revolution, the wheel turns at an angle of 2 π rad.

Then for 3 complete revolutions, it will take $3 \times 2\pi = 6\pi$ radians.

Question: 14

A train is moving

Solution:

Radius = 1500 m.

Train speed at rate of 66km/hr = 18.33 m/s

Therefore, Distance covered in 1 second = 18.33 m

Distance covered in 10 second = 18.33 × 10 = 183.33m

We know that θ = Distance / radius

θ = 183.33 / 1500

= 0.122 radian

Therefore $\theta = 0.122 \times \frac{180}{\pi} = 7°$

Question: 15

A wire of length

Solution:

θ will be in degrees.

Arc-length can be given by the formula : $\theta / 360° \times 2\pi r$

Hence it is given that 121 cm is the arclength.

$\Rightarrow 121 = \theta / 360° \times 2\pi r$

$= 121 = \theta / 360° \times 2 \times 22 / 7 \times 180$

$= 121 = \theta / 360° \times 360 \times 22 / 7$

$= 121 = \theta \times 22 / 7$

$\Rightarrow \theta = 121 \times 7 / 22$

= 38.5°

Hence the angle subtended at the middle is 38.5°

Which can also be written as 38° 30.'

Question: 16

The angles of a q

Solution:

Let the smallest term be x, and the largest term be 2x

Then AP formed= x, ?, ?, 2x

so,

$$S_n = \frac{n}{2}[2a + (n - 1)d]$$

$$S_n = \frac{n}{2}[a + (a + (n - 1)d)] = \frac{n}{2}[\text{First term} + (\text{Last term})]$$

360°= 4/2 [x+ 2x]....[We know that → a+(n-1) d= last term= 2x]

⇒ 180°= 3x

⇒ x= 60°

Now, 60° is least angle.

= 60°= π/180° × 60°

⇒ 60° = π/3 rad